

RECYCLED PRODUCTS

**ENVIRONMENTALLY SOUND
ECONOMICALLY SMART**

"Rubberized asphalt concrete is a cost-effective product. I encourage all cities and counties to consider using it for their roadways."

*— Chris McKenzie, Executive Director
League of California Cities*



Introduction

Rubberized Asphalt Concrete

Recycled Aggregate

Tire Derived Aggregate

Organic Materials

Dear Public Official:

Our State has long been an innovative leader in the environmental arena by taking a proactive approach to protecting natural resources and diverting unnecessary waste from landfills. We have also recognized significant cost savings at the local and state level by using recycled-content and environmentally friendly materials.

Each of us plays an important part in protecting the environment, public health and safety, by promoting the management of all materials to their highest and best use.

The first step in realizing these benefits is to ensure that, at the statewide and local level, recycled-content materials are used on a regular basis. By choosing specific recycled-content products for road applications, public works projects and landscaping uses, you are taking an important step to seeing long-term cost savings as well as helping protect the environment.

On the following pages you will find information on four important recycled-content materials that can provide our state and your local jurisdiction with many positive and cost-effective solutions.

I encourage you to become familiar with these products, consider their uses and benefits and work within your jurisdiction to purchase these materials for upcoming projects.

Margo Reid Brown

Margo Reid Brown, Chair
California Integrated Waste Management Board



Rubberized Asphalt Concrete

California currently generates more than 40 million scrap tires annually. These are tires that have outlived their purpose and can potentially threaten California's environment and our health if not managed properly. While nearly 75 percent of these tires are recycled, our State still faces the challenge of handling over ten million scrap tires annually, the majority of which end up in landfills or, in some cases, illegal stockpiles.

Rubberized asphalt concrete is a road material made with recycled tires. It is commonly known as RAC and has been in use since the late 1970s. RAC is a proven product, one that is cost-efficient and an environmentally friendly alternative to traditional road paving.

Success Stories

The city of Thousand Oaks knows first hand the benefits of using RAC. The city has been using the product since 1992.

To date, the city has used rubber from 1.55 million discarded tires in its pavement rehabilitation projects. The city found that the improvements of increased skid resistance, reduced road noise, improved riding qualities,

and imperviousness to water have made the use of RAC cost-effective on a life cycle basis and more desirable than traditional asphalt concrete.

Grants are Available

The CIWMB offers funding to local governments for RAC projects. Grants are awarded regularly in varying amounts. Technical assistance is also available through the CIWMB for RAC users.

Organic Materials
Tire Derived Aggregate
Recycled Aggregate
Rubberized Asphalt Concrete

Good for the Bottom Line

RAC is cost-effective. A two-inch thick rubberized asphalt concrete overlay can save as much as \$50,000 per lane mile when compared to a four-inch thick conventional asphalt overlay.

RAC is long lasting. It resists cracking and case studies have demonstrated over and over again that RAC, when designed properly, lasts much longer than conventional materials – often 50 percent longer. This saves on maintenance costs.

Good for the Community

RAC is durable, safe and quiet. One of the most compelling arguments for using RAC is the potential to quiet our roadways. Research has shown that noise can be reduced as much as 85 percent in some instances. Additionally, RAC provides better traction and visibility in wet weather, which may reduce highway accidents.

Good for the Environment

RAC is environmentally friendly. A two-inch thick resurfacing project uses over 2,000 scrap tires per lane mile. This means that for a one-mile section of a four-lane highway, over 8,000 scrap tires can be used in creating a safer, quieter, longer-lasting road!

Using RAC can help reduce the number of scrap tires that go into our landfills.



"The City of Thousand Oaks is quite pleased with its experience with RAC. We've been using RAC for over a decade and encourage the use of this product in other California cities. If we can see the benefits of RAC so can you."

— Tom Pizza, P.E.

Engineering Division Manager, City of Thousand Oaks
Construction and Right of Way Management

Contact Information

To learn more about how your jurisdiction can benefit from RAC, visit www.ciwmb.ca.gov or call (916) 341-6441.

Recycled Aggregate

Approximately two billion tons of aggregate are used annually and demand is expected to increase 25 percent by the year 2020.

With demand increasing, new sources of quality aggregates are difficult to site in California. Because of this, during the past 30 years, recycled aggregate – a product that comes from crushing old concrete and asphalt for use as base material in road projects – has become a popular, environmentally preferred material that meets Caltrans' specifications and has a proven performance track record.



Success Stories

In 2005, San Mateo County adopted a policy specifying that recycled aggregate be the preferred material for all non-structural concrete applications, including but not limited to sidewalks, base material, and sub base material. Suppliers have been able to provide the material needed at the

same or lower cost, and results have been favorable. Not only has the county been able to implement this policy without added cost to the taxpayers, it supports the County's long term goal to reduce the amount of material that needs to be landfilled.

Good for the Bottom Line

Recycled aggregate can provide a significant cost savings. The amount of money saved for a project can range from \$3 to \$10 a ton. Recycled aggregate can save up to \$53,000 per lane mile when it is used in place of virgin, mined aggregate.

Good for the Community

Recycled aggregate has many uses. While the primary use is base in road projects, recycled aggregate can also be used as concrete in sidewalks, gutters and curbs, gravel road surfacing, building foundation base and as fill for utility trenches.

Recycled aggregate is readily available.

Because of the demand for the product, there are approximately 100 producers of recycled aggregate in California. Visit the CIWMB's Web site to locate a producer in your region.

Good for the Environment

Recycled aggregate can help you meet your diversion goals. By using recycled aggregate, 6,500 tons of aggregate can be diverted from the average California landfill yearly. Using recycled aggregate can also extend the life of virgin aggregate mines and reduce the need to site new ones.



"By using recycled aggregate, we were able to be efficient, save money and help our environment. It was an easy choice for San Mateo County."

— Diana Shu, Senior Engineer
Public Works Department of San Mateo County

Contact Information

To learn more about how your jurisdiction can benefit from recycled aggregate, visit www.ciwmb.ca.gov/condemo or call (916) 341-6500.



Tire Derived Aggregate

Tire derived aggregate (TDA), which is made from shredded tires and is used for multiple public works projects, provides the second largest reuse of tires in the United States.

With California using approximately four to six million tires per year, and increased use anticipated, TDA plays a major role in providing a solution to diverting California's scrap tires from landfills.

Success Stories

As part of its continuing effort to help develop and promote cost-effective markets for scrap tires, the CIWMB entered into an interagency agreement with Caltrans to help build the new Highway 880/Dixon Landing interchange.

In this project, Caltrans used tire derived aggregate to construct a freeway on-ramp embankment. This project used 660,000 scrap tires and resulted in a \$240,000 savings for California.

In another joint project, Caltrans used tire shreds made from 80,000 waste tires as backfill behind a 200-foot section of retaining wall in the City of Riverside.

The pilot project demonstrates that tire shreds exert less pressure on a retaining wall than conventional gravel or soil. This new retaining wall design, which contains less steel than a standard wall, is more cost-effective.

Good for the Bottom Line

TDA can save your jurisdiction money.

TDA can save as much as 50 percent over conventional lightweight aggregate. It also provides a cost-effective solution to drainage problems, vibration mitigation in light rail projects and landslide repairs.

Good for the Community

Tire derived aggregate has many benefits. It is an excellent alternative to conventional lightweight backfills, is long lasting, absorbs vibration and is free draining.

Tire derived aggregate has multiple

uses. It can be used behind retaining walls as a lightweight backfill, as vibration mitigation in light rail projects, and in landfills as a gas collection system and drainage layer. TDA is also being used to overcome road building challenges posed by weak foundation soils due to its durability and light weight.

Good for the Environment

TDA helps reduce the amount of tires entering our landfills.

TDA is a versatile product that can provide not only California, but the U.S., with a useful and cost-effective alternative for scrap tires.



“On the Dixon Landing interchange project, Caltrans needed lightweight embankment fill because of weak Bay Mud. TDA saved Caltrans nearly \$250,000 over the next cheapest alternative. Moreover, the project used over 600,000 tires – a win for everyone.”

— Dana N. Humphrey, Ph.D., P.E.
Professor of Civil Engineering, University of Maine
Engineering Consultant to the Dixon Landing Project

Contact Information

To learn more about how your jurisdiction can benefit from TDA, visit www.ciwmb.ca.gov or call (916) 341-6441.



Organic Materials

More than 30 percent of California's waste stream consists of organic materials such as landscape trimmings, food scraps and other materials. This makes it one of the largest portions of the solid waste stream.

By using organic materials, California cities and counties can help meet their 50 percent diversion mandate. Purchasing and using local, quality products can help your jurisdiction receive direct economic and environmental benefits.

Success Stories

The city of Modesto operates its own composting facility, "Modesto Composting." Through the facility, the city is able to divert green material and biosolids from disposal. Since 1998, the program has enabled the city to save more than \$5 million on the cost of landfilling their organic materials.

The city has also generated revenues through the sale of compost products and since 1998 has diverted more than 360,000 tons of organic materials from disposal.

Good for the Bottom Line

Organic materials are cost-effective.

By using compost and mulch, long-term economic benefits can be recognized. Not only can you reduce landscaping costs by controlling weeds, conserving water and reducing labor expenses, but cost savings can be attained by:

- *Reducing the use of herbicides and fertilizers*
- *Avoiding landfill disposal costs and tipping fees*

Good for the Community

Using organic materials creates jobs.

Nearly 170 businesses in California produce compost and mulch, making it readily available throughout the State. Producers in your area are listed on the CIWMB Web site.

There are multiple uses for organic materials.

If your jurisdiction produces a large quantity of organic materials, consider the following opportunities:

- *Building landscaping*
- *Parks and playground areas*
- *Roadway landscaping*
- *Erosion control and storm water runoff projects*
- *Residential backyard composting*

Good for the Environment

Organic materials help the environment.

When organic materials are used they create healthier soils and more vibrant plants. This long-lasting benefit means that with consistent use, not only are you saving money – reducing the amount of fertilizers and herbicides used – but soil is being revitalized.



“Our city has benefited greatly from the composting facility and by using organic materials on a variety of landscaping, road and beautification projects.”

— Jocelyn Reed

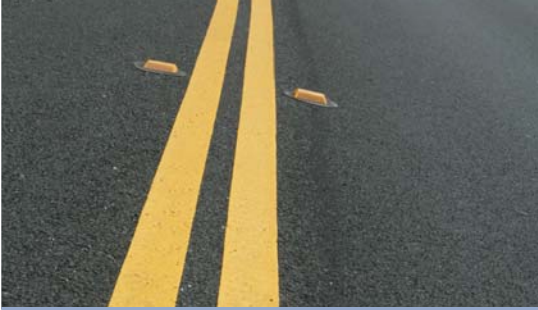



Solid Waste Program Manager
City of Modesto

Contact Information

To learn more about how your jurisdiction can benefit from organic materials, visit www.ciwmb.ca.gov or call (916) 341-6620.

Recycled-Content Materials

Benefits & Uses

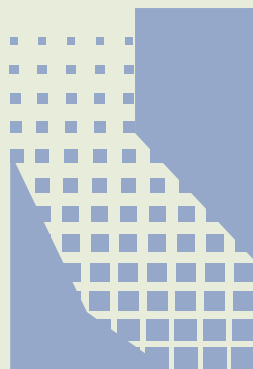
	Product	Definition
	Rubberized Asphalt Concrete	Rubberized asphalt concrete (RAC) is a road material made with recycled tires.
	Recycled Aggregate	Recycled aggregate comes from crushing old concrete and asphalt for base in road projects.
	Tire Derived Aggregate	Tire derived aggregate (TDA) is made up of shredded tires and is used for several public works projects.
	Organic Materials (compost & mulch)	<p>Compost is made from the managed decomposition of organic materials such as leaves, manure and crop residue.</p> <p>Mulch is ground-up yard trimmings and/or wood chips.</p>

Uses	Benefits	Contact Information
<ul style="list-style-type: none"> • Road overlay • New surface course 	<ul style="list-style-type: none"> • Cost-effective • Long lasting and durable • Safe and skid resistant • Reduces noise by 85 percent • Provides color contrast • Reduces landfill 	<p>(916) 341-6441 or www.ciwmb.ca.gov</p>
<ul style="list-style-type: none"> • Road base • Curbs, gutters and sidewalks (non-structural) • Surfacing in gravel roads • Building foundation base • Fill for utility trenches 	<ul style="list-style-type: none"> • Cost-effective • Multiple uses • Durable • Helps meet diversion goals 	<p>(916) 341-6500 or www.ciwmb.ca.gov/condemo</p>
<ul style="list-style-type: none"> • Retaining wall backfill • Landslide repair • Lightweight and conventional fill • Drainage layers • Light rail projects • Landfill gas collection 	<ul style="list-style-type: none"> • Cost-effective • Long lasting • Lightweight • Vibration absorption • Second largest use of tires in U.S. 	<p>(916) 341-6441 or www.ciwmb.ca.gov</p>
<ul style="list-style-type: none"> • Roadway landscape applications • Erosion prevention • Topsoil production • Parks and playgrounds • Storm water run-off applications • Residential backyard composting 	<ul style="list-style-type: none"> • Cost-effective • Creates markets for local producers • Creates healthier soil and plants • Conserves water • Helps meet diversion goals 	<p>(916) 341-6620 or www.ciwmb.ca.gov</p>

Recycled-Content Materials

Cost Comparisons

Product	Project Description	Conventional Materials Quote	Recycled Materials Quote	Cost Savings
Rubberized Asphalt Concrete	Southern California project requiring 4-inch overlay of conventional asphalt	\$54,520 (1,584 tons @ \$30.00 /ton plus pavement prep)	\$31,668 (754 tons @ \$42.00 per ton)	\$22,852
Recycled Aggregate	Southern California project requiring 17 inches of aggregate base for one lane mile (major arterial)	\$115,150 (5,331 tons @ \$21.60 /ton; delivered cost)	\$59,814 (5,331 tons @ \$11.22 per ton; delivered cost)	\$55,336
Tire Derived Aggregate	Highway 880 interchange at Dixon Landing	\$491,820 (7,026 tons @ \$70 per ton) in place	\$251,826 (6,627 tons @ \$38 per ton) in place	\$239,994
Organic Materials (compost & mulch)	Caltrans LA-60 Highway Project, L.A. County (City of Industry and Diamond Bar) February 2006	\$389,376 (materials and labor) forest-derived mulch @\$30.58/cubic yard	\$194,688 (materials and labor) curbside-derived mulch @\$15.29/ cubic yard	\$194,688



INTEGRATED
WASTE
MANAGEMENT
BOARD

www.ciwmb.ca.gov